APPENDIX A

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JOHN ELIAS BALDACCI
GOVERNOR

DAWN R. GALLAGHER
COMMISSIONER

McCain Foods USA, Inc., Tatermeal Facility	)	Departmental
Aroostook County	)	Findings of Fact and Order
Presque Isle, Maine	)	Air Emission License
A-459-71-D-A	)	Amendment #2

After review of the air emissions license amendment application, staff investigation reports and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 M.R.S.A., Section 344 and Section 590, the Department finds the following facts:

I. REGISTRATION

A. Introduction

1. McCain Foods USA, Inc. was issued license A-459-72-B-R for their Tatermeal facility (Tatermeal) in Presque Isle, Maine on April 22, 1997.

2. McCain Foods USA, Inc. has requested an amendment to their license to address VOC RACT for the Tatermeal facility as required by Chapter 134 of the Department's regulations.

B. Emission Equipment

Tatermeal is authorized to operate the following equipment:

Fuel Burning Equipment

Equipment	Maximum Design Capacity (MMBtu/hr)	Maximum Design Firing Rate (gal/hr)	Fuel Type, % sulfur	Date of Const.	Control Device	Stack #
Kiln #1	30	215	#6 oil, 2.0%	Pre 1974	cyclone	1
Kiln #2	30	215	#6 oil, 2.0%	Pre 1974	cyclone	2
Kiln #3	60	428	#6 oil, 2.0%	1980	cyclone	3

C. Application Classification

This application for Tatermeal is to address VOC RACT requirements as per Chapter 134 of the Department's regulations and to address new VOC emission data that was revealed in stack testing results. The application is considered an amendment and is being processed as such.

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II. AMENDMENT DESCRIPTION

A. McCain Foods USA, Inc., on November 13, 2002, submitted an application to amend their license to address reasonable available control technology (RACT) for volatile organic compounds (VOC) as required by Chapter 134 of the Department's regulations for their potato waste drying facility (Tatermeal) located in Presque Isle, Maine.

Chapter 134 of the Department's regulations requires that any facility that has the potential to emit 40 tons or more of VOC per calendar year is subject to the requirements of Chapter 134. The facility was not thought of in the past to emit VOC in quantities in excess of 40 tons per year. However, after stack testing performed in November, 2001 revealed that VOC emissions are higher than originally licensed, it has been determined by the Department that the facility is subject to Chapter 134.

On August 14, 2002, the Department requested that McCain Foods USA, Inc. submit a VOC RACT analysis in accordance with Chapter 134 Part 3, Subpart A. McCain Foods USA, Inc. conducted an alternative feasibility study in accordance with the plan requirements for Option C: VOC Alternative Reduction Program (Source Specific RACT Determination) of Chapter 134.

B. Equipment Description

Tatermeal operates three dryers that dehydrate primarily potato wastes to produce a material used as a binder and nutritional supplement in animal feed. The potato waste is supplied by McCain's operations in Easton, Maine and other regional food-processing plants, as well as by local growers. The three dryers are direct-contact rotary dryers that combust #6 fuel oil with a sulfur content no greater than 2.0% sulfur by weight. Potential VOC emissions from fuel combustion in the three dryers is approximately 1.7 tons per year based on a 1.28 pound of VOC per 1000 gallons of #6 fuel emission factor that was taken from the Environmental Protection Agency's (EPA) Compilation of Air Pollutant Emission Factors (AP-42) and the current license annual fuel usage limit of 2,628,000 gallons of #6 fuel oil per year.

As stack testing has revealed, there is significant VOC emissions from the drying of the potato waste in addition to the small amount of VOC emissions from the fuel combustion. During stack testing, three test runs were made for each of the smaller dryers, Dryers #1 and #2, while four test runs were performed for Dryer #3. Testing was conducted for various mixtures of potato waste and the results indicated a wide variation in hourly VOC emissions rates. Potential VOC emissions were estimated for each unit assuming the highest measured hourly emission rate occurs for each of the 8,760 hours of the year and adding a 15% safety margin to account for operational variability and flexibility. Using this approach, potential VOC emissions from the three dryers is estimated at 70.0 tons per year for Dryers #1 and #2 each and 65.6 tons per year for Dryer #3, for a total of approximately 205.5 tons of VOC as carbon per year for all dryers combined.

Tatermeal also utilizes a Safety-Kleen parts degreaser that is used to clean equipment parts. The degreaser utilizes Safety-Kleen Premium Solvent, which is 100% VOCs. The facility uses no more than 50 gallons of solvent per year in the degreaser, which amounts to VOC emissions of approximately 0.2 tons per year.

C. Feasibility of Add-On VOC Control Equipment

As required under the Option C Plan Requirements of Chapter 134, McCain Foods USA, Inc. examined the technical and economic feasibility of available add-on control device equipment for the dryers at the Tatermeal facility. This examination included consideration of incineration, condensation, wet and dry scrubbing and biological treatment.

1. Thermal Oxidizer/Incinerator

Both thermal and catalytic incineration was considered in the VOC RACT feasibility study. Incineration is an oxidation process in which organic compounds are converted to carbon dioxide and water.

a. Thermal incinerators are classified as either regenerative or recuperative. The regenerative incinerator utilizes a flame-based combustion chamber that connects two or three fixed beds containing inert (i.e. ceramic) packing. The exhaust stream enters the incinerator through a bed, which preheats the gas to near its final oxidation temperature. The gas then flows into the combustion chamber, where it is oxidized. The regenerative incinerator typically achieves efficiencies of from 95% to 99%. This design has a high initial and operational cost associated with it.

b. The recuperative incinerator utilizes a shell and tube heat exchanger to preheat exhaust gases before they enter a combustion chamber where, exposed to a flame, volatile organic compounds are incinerated. This design is typically used in applications with low gas flow rates and high VOC densities and in these applications can achieve efficiencies of 98% to 99.9%. However, this design has a much lower thermal efficiency, and as a result is far less economical for applications with high flow rates and low VOC concentrations such as those from Tatermeal.

c. Catalytic incinerators are similar to recuperative incinerators, modifying the flame-based incinerator to utilize a catalyst to promote incineration at lower temperatures. Catalytic incinerators are most effective in applications where there is little change in VOC concentrations and where contaminants that could foul the catalyst are not present. Where the concentration of volatile organic compounds is inconsistent and the likeliness of clogging or deactivation of the catalyst from particulate matter carried in the exhaust stream from drying potato waste, a catalytic incinerator is not a viable candidate for this application. The catalyst is also subject to contamination from sulfur and vanadium from the use of auxiliary fuel burning. Tatermeal will be firing #6 fuel oil with a sulfur content of 2.0% sulfur by weight in the dryers, which would cause a decrease in catalyst life and as a result a decrease in the systems overall efficiency. For these reasons, use of a catalytic incinerator is not technically feasible for this application.

d. Given the limitations of recuperative thermal oxidizers and catalytic oxidizers, McCain Foods USA, Inc. examined the cost associated with installation and operation of a regenerative thermal oxidizer to determine the economic feasibility of this design for use in VOC emissions reduction for the Tatermeal operation. Based on vendor information provided to McCain Foods USA, Inc. from Quality Engineered Solutions, Ltd. (QES) of Fredericton, New Brunswick, Canada, the total capital investment for an RTO, including purchased equipment costs and direct and indirect installation costs, would be approximately $2,349,470. The annual cost to operate and maintain the RTO were estimated to be approximately $1,161,961 per year, assuming the use of 0.5% sulfur #6 fuel oil as auxiliary fuel. Based on information from QES as provided by several incinerator suppliers, 95% VOC removal efficiency was assumed for the RTO for the purpose of the cost evaluation.

As indicated above, potential VOC emissions as carbon from the three dryers are approximately 205.5 tons per year and assuming a 95% efficiency of the RTO, VOC emissions would be reduced by 195.2 tons per year. The resulting cost effectiveness based on capital and annual cost would be approximately $ 17,989 per ton of VOC removed. If the capital costs are annualized assuming a ten-year economic life for the control equipment and a seven percent interest rate, the cost effectiveness would be approximately $7,667 per ton of VOC reduction. Based on this analysis, discussions with vendors, and EPA documentation, the high capital and operating costs associated with use of an RTO make this technology infeasible for control of VOC emissions from the dryers at Tatermeal.

2. Condensation

Applications with a condenser alone, a condenser with refrigeration and a condenser with chemical oxidation were considered in the VOC RACT feasibility study. Condensation is a process in which volatile organic compounds are separated from the gas stream through saturation followed by a phase change. The phase change is achieved either by increasing the system pressure at a given temperature, or by lowering the temperature at a constant pressure. In a two component system in which one of the components is non-condensable (i.e., air), condensation occurs at dew point (saturation) when the partial pressure of the volatile organic compound is equal to its vapor pressure. The more volatile the compound, the larger the amount that can remain as vapor at a given temperature, hence the lower the temperature required for condensation.

a. QES conducted sampling in order to estimate the VOC reduction that could be expected from Tatermeal's dryers if condensation was utilized as VOC control. QES estimated that the lowest temperature that the dryer exhaust could reasonably be reduced to was from between 150°F and 206°F down to between 80°F and 85°F. Thus, this temperature range was maintained during QES sampling. The exhaust gas sample was analyzed in accordance with the National Institute for Occupational Safety and Health Method 1500 and based on that analysis it was determined that the majority of VOCs in the dryer exhaust are not condensable at the 80°F and 85°F temperature range. Therefore, a condenser alone would not be a technically feasible option for Tatermeal.

b. The use of a refrigerated condenser was next evaluated. This type of technology is often utilized to obtain low temperatures required for acceptable removal efficiencies. This type of system is normally used for operations with exhaust stream VOC concentrations above 5000 ppm, such as gasoline bulk terminals and storage. According to U.S. EPA, office of Air Quality Planning and Standards, "Survey of Control Technologies for Low Concentration Organic Vapor Gas Streams", condensation is not generally applicable to gases with organic vapor concentrations at levels below several thousand ppm. If this technology were utilized, it would also generate a large volume of wastewater that would require the facility to construct an onsite wastewater treatment plant, further increasing the cost and operational burden of Tatermeal. The large volume of exhaust gas flow and the relatively low concentrations of VOCs in the exhaust stream, coupled with the need for wastewater treatment, make this technology a technically infeasible option for VOC control for the dryers at Tatermeal.

c. QES investigated the use of a condenser in conjunction with chemical oxidation as a control device. According to QES, the design of the condenser would be a function of the total exhaust flow from the dryers. The condenser would need to be large enough to provide adequate contact time between the exhaust gas and the cooling water for sufficient energy transfer. It was assumed that a cooling tower would be needed to cool the water from the condenser to a temperature adequate for condensation. Where the condenser would remove a certain amount of VOCs, a scrubber could be utilized to remove the non-condensable VOCs that remain in the exhaust stream. The scrubber could be placed in the system downstream of the condenser and a chemical reagent could be injected into the scrubber to oxidize the non-condensable compounds trapped by the scrubber solution and a second reagent would be needed to control solution pH. The VOC removal efficiency of this type of system is uncertain, although QES has estimated the efficiency to be between 50% and 90%. QES has indicated that an actual efficiency could not be determined without a substantial commitment in time and expense to piloting activities.

d. Given the limitations of utilizing a condenser alone or a refrigerated condenser, McCain Foods USA, Inc. examined the economic feasibility of the installation and operation of a condenser used in conjunction with a scrubber injected with a chemical oxidizer. Based on vendor information provided by QES, the total capital investment for a condensation/chemical oxidation system, including purchased equipment costs, direct and indirect installation costs, would be approximately $2,348,625. The annual cost to operate and maintain the system were estimated at approximately $986,667 per year.

As indicated above, potential dryer VOC emissions as carbon are approximately 205.5 tons per year and for the purpose of this evaluation, the VOC removal efficiency of the system was assumed to be 70%. This would provide for a VOC emission reduction of approximately 143.9 tons of VOC per year. The resulting cost effectiveness based on capital and annual cost would be approximately $23,186 per ton of VOC removed. If the capital costs are annualized assuming a fifteen-year economic life for the control equipment and a seven percent interest rate, the cost effectiveness would be approximately $8,652 per ton of VOC reduction. These estimated costs do not include purchase, installation and operating costs of an onsite wastewater treatment operation. Based on this analysis, discussions with vendors, and EPA documentation, the high capital and operating costs associated with use of an RTO make this technology infeasible for control of VOC emissions from the dryers at Tatermeal.

3. Adsorption/Dry Scrubbing

Adsorption is a process in which molecules adhere to a solid surface in a thin layer. In this type of system, the exhaust stream gases would pass through a porous solid and the volatile organic compounds would collect on the solid surfaces. This design can achieve efficiencies of 95% to 98% in applications where the VOC concentrations are between 500 ppm and 2000 ppm. Where the VOC concentration in the Tatermeal dryer exhaust is lower than these numbers, lower removal efficiency may result. QES found that vendors would not recommend this technology for application at Tatermeal because particulate matter in the dryer exhaust gases would likely cause plugging. Furthermore, this design does not accommodate large gas flow rates. Therefore, this technology is not a technically feasible option for Tatermeal.

4. Wet Scrubber/Absorption

A wet scrubber design would allow for the removal of organic and inorganic vapors in the gas stream by dissolving them in a liquid, usually water. Typical removal efficiencies for organic gases ranges from 70% to 99% depending on the gas, type of solvent and type of absorber. However, this design in applications for organic gas removal is subject to several limitations and problems, including the availability of a suitable solvent and the availability of vapor/liquid equilibrium data for the specific organic/solvent system of concern. The design is also susceptible to plugging if used in an application where there is a great deal of particulate matter in the gas stream. The wet scrubber design is more typically used in applications where gas concentrations are high. The tall towers, long contact ties and high liquid to gas ratios needed to obtain sufficient VOC removal may not make this technology economically feasible.

For a wet scrubber to be effective, the vapors to be absorbed must be soluble in the fluid to be used, as only vapors that are soluble can be removed. Based on information supplied from QES, a large variety of the VOCs emitted from the dryers are not soluble in water. In addition, a waste material and solvent medium treatment or disposal issue is created and as indicated above, Tatermeal does not already have a wastewater treatment facility and the local municipality is not interested in taking on the burden of treating the large quantities of VOC laden wastewater. For these reasons, use of this design is not considered technically or economically feasible.

5. Biological Treatment

Biofiltration is the process of bringing the gas stream into contact with a biologically active material and microorganisms will break down the compounds into carbon dioxide, water, mineral salts and microbial biomass. Typical filter media are mixtures of compost, peat or biologically active soils. This technique is typically suitable for applications where the gas stream is of constant composition, ambient temperature, humidity and virtually free of particulate matter which would act to clog the bed pores. This design can be fragile and very sensitive to changes in temperature, pH and moisture that could cause bed sterilization. In order for this design to be effective at Tatermeal, the facility would have to increase the airflow to the exhaust gas stream to reduce the relative humidity of the gas stream to 50%. The biofilter itself would have to be approximately 2.5 acres in size to accommodate the large high flow rates of the exhaust gas and added air. No documentation could be found and no vendors could provide any examples where biological treatment has been successful in controlling emissions similar to those from Tatermeal's dryers, therefore this design is not considered technically feasible.

D. The EPA RACT/BACT/LAER Clearinghouse (RBLC) was searched for any RACT determination made for equipment or processes similar to the potato waste drying process at Tatermeal. No entries were found in the Clearinghouse for any potato waste drying operations similar to those at Tatermeal. However, seven facilities were identified having the same Standard Industrial Classification (SIC) code as Tatermeal, i.e., 2048, Prepared Feeds. Only one of the seven facilities addressed VOC emissions, Superior Agresources. BACT for VOC emissions for the dryers and pelletizing equipment at this facility was determined to be the use of natural gas, implying that VOC emissions were generated from fuel burning. Where natural gas is not available at this time in Presque Isle and where the majority of VOC emissions are generated from the drying potato waste, converting to natural gas is not a technically or economically feasible approach to reducing VOC emissions.

E. The alternative feasibility study for VOC RACT also requires examination of the technical and economic feasibility of changing to low VOC emitting processes, i.e., pollution prevention options. As discussed above, the vast majority of VOC emissions from the dryers are generated from the drying potato waste and the contribution to the VOC emissions from fuel combustion is slightly less than 0.1% of the total VOC emissions. Any changes in fuel oil type or usage would result in relatively little VOC emissions reduction. Furthermore, reduction in drying time may result in a product with that has an unstable shelf life.

McCain Foods USA, Inc. has made operational changes at the Tatermeal facility to reduce fugitive VOC emissions from the potato waste prior to the drying process. These changes include processing the oldest waste first and not accepting potato waste that has gone septic. However, it is not possible to quantify any actual emissions reductions that may result from these changes.

F. VOC Emissions

McCain Foods USA, Inc. has agreed to restrict Tatermeal's total annual VOC emissions to 208 tons per year on a twelve-month rolling total basis. Tatermeal shall maintain VOC emissions records to demonstrate compliance with the VOC emission restriction. The records shall be maintained on a monthly and twelve-month rolling total basis. A copy of the record shall be submitted to the Department on a semiannual basis with submittals due within 30 days after the end of the second and fourth calendar quarters.

For the purposes of estimating the annual VOC emissions from the drying process at Tatermeal, an emission factor of 79.5 pounds of VOC per 1,000 gallons of fuel combusted may be used, as proposed by McCain Foods USA, Inc. The factor was calculated based on stack test data from testing performed in November, 2001 and assuming a linear relationship between VOC emissions, product produced and fuel consumed.

The current license for the Tatermeal facility includes an annual fuel restriction of 2,628,000 gallons of #6 fuel at a sulfur content of 2.0 % sulfur by weight based on a twelve-month rolling total. Due to the calculation of the annual fuel restriction times the VOC emission factor being much less than the 208 tons of VOC restriction, maintaining this annual fuel restriction will ensure that the Tatermeal facility will not exceed the annual VOC emissions restriction.

G. Annual Emissions

Tatermeal has the following annual VOC emissions, based on a 12-month rolling total:

Total Allowable Annual Emission for the Facility
(used to calculate the annual license fee)

Pollutant	Tons/Year
VOC	208

ORDER

The Department hereby grants Air Emission License Amendment A-459-71-D-A subject to the conditions found in Air Emission License A-459-72-B-R, in amendment A-459-71-C-M and in the following conditions:

The following shall be in addition to Condition (12) of Air Emission License A-459-72-B-R:

g. Tatermeal shall not exceed an annual fuel use limit of 2,628,000 gallons of #6 fuel oil, with a sulfur content of no greater than 2.0% sulfur by weight, based on a twelve-month rolling total.

h. McCain Foods USA, Inc. shall maintain fuel use records for the Tatermeal dryer system. The records shall be maintained on a monthly and twelve-month rolling total basis.

The following is a new condition:

(17) VOC Emissions

A. Tatermeal's total annual VOC emissions shall be restricted to 208 tons per year based on a twelve-month rolling total basis.

B. Tatermeal shall maintain a record of annual VOC emissions. The record shall be maintained on a monthly and a twelve-month rolling total basis.

C. Tatermeal shall submit a copy of the record to the Department on a semiannual basis with the initial semiannual report due January 30, 2004, for the period of July 1, 2003 through December 31, 2003. Subsequent reports shall be due on July 30 and January 30 of each year.

McCain Foods USA, Inc., Tatermeal Facility	)	Departmental
Aroostook County	)	Findings of Fact and Order
Presque Isle, Maine	)	Air Emission License
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(18) This amendment shall expire concurrently with Air Emission License A-459-72-B-R.

DONE AND DATED IN AUGUSTA, MAINE THIS 19th DAY OF March 2003.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: James P. Brooks for
DAWN R. GALLAGHER, COMMISSIONER

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: **November 13, 2002**
Date of application acceptance: **November 14, 2002**

Date filed with the Board of Environmental Protection: FILED MAR 20 2003 BOARD OF ENVIRONMENTAL PROT. STATE OF MAINE

This Order prepared by, Peter G. Carleton, Bureau of Air Quality